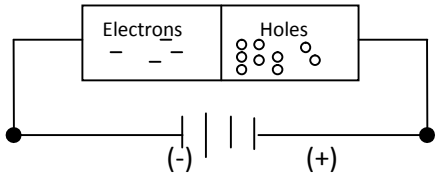
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GGSIPU physics 2014

Direction : (Q. No. 1-2) Base your answers to the following questions on the diagram below, Which represents a germanium semiconductor device.



1. In the diagram, section A represents the

(a) n-type germanium (b) p-type germanium

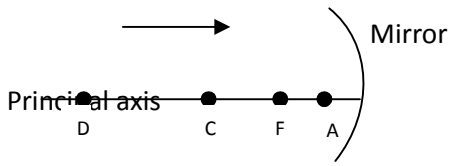
(c) anode (d) diode

2. The bias of the p – n junction shown in the diagram is

(a) C to D (b) E to F

(c) reverse (d) forward

3. The diagram below shows a ray of light traveling parallel to the principle axis of a concave spherical mirror. Point F is the principle focus and point C is the centre of curvature



After striking the mirror, the ray of light will be reflected through point

(a) A (b) D

(c) C (d) F

4. When a student looks into a plane mirror, she sees a virtual image of herself. However, when she looks into a sheet of paper, no such imege forms. Which light phenomenon occurs at the surface of the paper?

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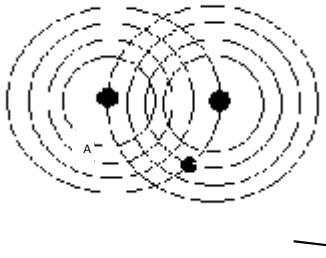
(a) Regular reflection

(b) Diffuse reflection

(c) Polarization

(d) Resonance

5. The diagram below shows two sources, A and B, vibrating in phase in the same uniform medium and producing circular wave fronts.



Which phenomenon occurs at point P ?

(a) Destructive interference

(b) Constructive interference

(c) Reflection

(d) Refraction

6. An atom of $^{131}_{53}I$ and an atom of $^{127}_{53}I$ contain the same number of

(a) quarks (b) neutrons

(c) nucleons (d) protons

7. An electric circuit contains an operating heating element and a lit lamp. Which statement best explains why the lamp remains lit when the heating element is removed from the circuit?

(a) The lamp and heating element were connected in parallel

(b) The lamp has less resistance than the heating element

(c) The lamp has more resistance than the heating element

(d) The lamp and heating element were connected in series

8. As 6.00 kg of a liquid substance as its freezing point completely freezes, it gives off enough heat to melt 3.00 kg of ice at 0^0C. The heat of fussion of the substance is

(a) 2.05 kJ/kg (b) 4.19 kJ/kg

(c) 167 kJ/kg (d) 668 kJ/kg

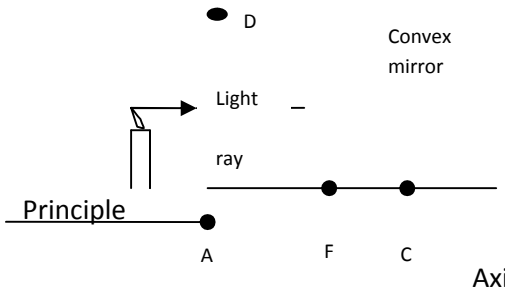
9. The diagram below shows a light ray parallel axis of a spherical convex (diverging) mirror. Point F is the virtual focal point of the mirror and C is



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the centre of curvature



After the light ray is reflected, it will pass through point

(a) A (b) C

(c) D (d) F

10. How do the freezing point and boiling point of ocean water compare to those of distilled water?

(a) Ocean water freezes at a lower temperature and boils at a lower temperature

(b) Ocean water freezes at a lower temperature and boils at a higher temperature

(c) Ocean water freezes at a higher temperature and boils at a lower temperature

(d) Ocean water freezes at a higher temperature and boils at a higher temperature

11. If you look through a piece of red-tinted glass,everything is seen in shades of red. Similarly if you look through a price of blue-tinted glass. Everything will be seen in shades of blue.

Consider the following statements

I. The tinting process makes the glass absorb the corresponding colour, i.e., red tinted glass strongly absorbs red light, making ever thing appear red.

II. The tinting process makes the glass absorb all colours except the corresponding colour, i.e.,red -tinted glass will strongly absorb blue and green, but not red

III. If you stack the red and blue-tinted pieces of glass and look through them, everything will look quite dark.

Which of these statements is/are true?

(a) I and II

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(b) I and III
(c) II and III
(d) Only I

12. The primary source of holes in p-n-p transistors is the

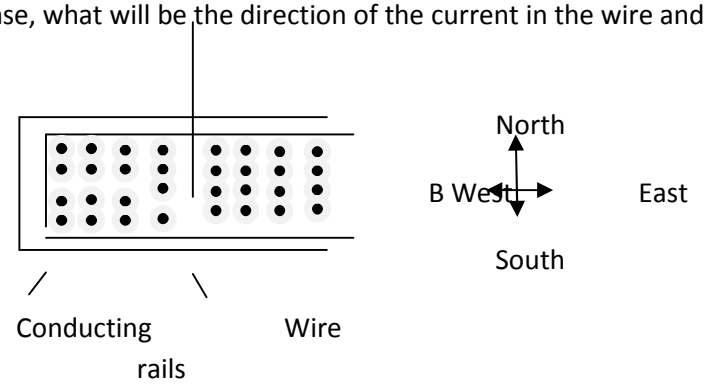
(a) transmitter

(b) Collector

(c) base

(d) emitter

13. A conducting wire sits on smooth metal rails as shown in figure.A variable magnetic field points out of the page. The strength of this magnetic field is increased linearly from zero. Immediately after the field starts to increase, what will be the direction of the current in the wire and the direction of the wire's motion?



	Current in wire	Motion of the wire
(a)	North	No-motion
(b)	North	East
(c)	South	West
(d)	South	East

14. Above an infinitely large plane carrying charge density σ, the electric field points up and is equal to $\frac{\sigma}{2\varepsilon_0}$. What is the magnitude and direction of the electric field below the plane?

(a) $\sigma/2\varepsilon_0$, down (b) $\sigma/2\varepsilon_0$, up

(c) σ/ε_0, down (d) σ/ε_0, up

15. A heat engine is 20% efficient. If the engine does 500 J of work every second, how much heat does the engine exhaust every second?

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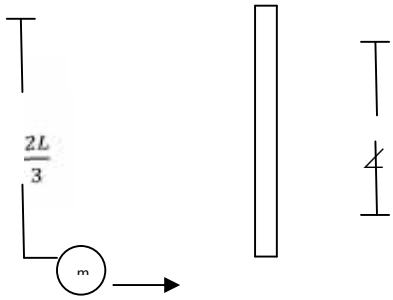
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(a) 2000 J (b) 2500 J (c) 400 J (d) 500 J

16. The front wheel on an ancient bicycle radius 0.5 m. It moves with angular velocity given by the function $\omega(t) = 2+4t_2$, where t is in seconds. About how far does the bicycle move between t = 2 and t = 3 seconds?

(a) 36 m (b) 27 m (c) 21 m (d) 14 m

17. What quantities are conserved in this collision



(a) Linear and angular momentum, but not kinetic
(b) Linear momentum only
(c) Angular momentum only
(d) Linear and angular momentum and linear but not rotational kinetic energy

18. A particle moves along the x-axis with a position given by the equation x(t) = 5+3t, where x is in meters, and t is in seconds. The positive direction is east. Which of the following statements about the particle is false?

(a) The particle is east of the origin at t = 0

(b) The particle is at rest at t = 0

(c) The particle's velocity is constant

(d) The particle's acceleration is constant

19. At what temperature is the rms velocity of a hydrogen molecule equal to that of an oxygen molecule equal to that of an oxygen molecule at 47^0C

(a) 80 K (b) -73 K (c) 20 K (d) 3 K

20. The quantity jerk, j, is defined as the time derivative of an object's acceleration,

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$J = \frac{da}{dt} = \frac{d^3x}{dt^3}$ What is the physical meaning of the area under a graph of jerk versus time?

(a) The area represents the object's change in acceleration
(b) The area represents the object's acceleration
(c) The area represents the object's change in velocity
(d) The area represents the object's velocity

21. A thorium nucleus emits an alpha particle. Which of the following fundamental physics principles can be used to explain why the direction of the daughter nucleus recoil must be in the opposite direction of the alpha emission?

I. Newton's third law

II. Conversation of momentum

III. Conversation of energy

(a) Only II (b) Only III

(c) I and II only (d) II and III only

22. Which of the following dpes not describe a ray that can be drawn for a concave mirror?

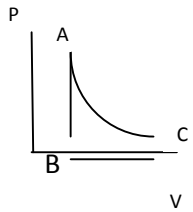
(a) An incident ray through the mirror's centre,reflecting right back through the centre

(b) An incident ray through the centre point,reflecting through the focal point

(c) An incident ray through the focal point, reflecting parallel to the principal to the principal axis

(d) An incident ray parallel to the principal axis, reflecting through the focal point

23. The state of a gas in a cylinder is represented by the pV diagram shown below. The gas be taken through either the cycle ABCA, or the reverse cycle ACBA. Which of the following statements about the work done on or by the gas is correct?



(a) In both cases, the same amount of net work is done by the gas
(b) In both cases, the same amount of net work is done by the gas

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(c) In cycle ABCA network is done on the gas, in cycle ACBA the same amount of network is done by the gas

(d) In cycle ABCA net work is done by the gas, in cycle ACBA the same amount of net work is done on the gas

24. A cube of ice(specific gravity 0.90) floats in a cup of water. Several hours later, the ice cube has completely melted into the glass. How does the water level after melting compare to the initial water level?

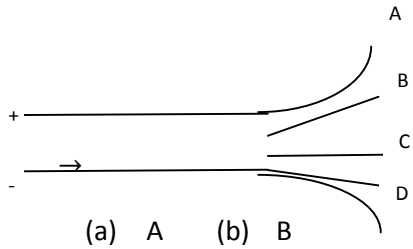
(a) The water level is unchanged after melting

(b) The water level is 10% higher after melting

(c) The water level is 90% higher after melting

(d) The water level is 10% lower after melting

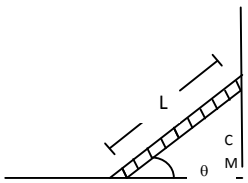
25. A proton moving at constant velocity enters the region between two charged plates, as shown below. Which of the paths shown correctly indicates the proton's trajectory after leaving the region between the charged plates?



(a) A (b) B

(c) C (d) D

26. A ladder of length L leans against a wall at an angle of θ from the horizontal, as shown in figure. The normal force F_N applied from the ground on the ladder applies whattorque about the ladder's centre of mass?



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(a) $F_N(L/2)$ (b) $F. L\cos\theta$

(c) $F_N L\sin\theta$ (d) $F_N(L/2)\cos\theta$

27. 250 g of water and equal volume of alcohol of mass 200 g are replaced successively in the same calorimeter and cool from 60^0 to 55^0 in 130s and 67s respectively. If the water equivalent of the calorimeter is 10 g, then the specific heat of alcohol in cal/g^0 C is

(a) 1.25 (b) 0.69

(c) 0.62 (d) 0.68

28. A satellite orbits the moon far from its surface in a circle of redius r. If a second satellite has a greater speed, yet still needs to maintain a circular orbit around the moon, how should the second satellite orbit?

(a) With a redius r

(b) With a redius greater than r

(c) With redius less than r

(d) Only an eccentric elliptical orbit can be maintained with a larger speed

29. Light waves travelling through travelling through air strike the surface of water at an angle.Which of the followingstatements about the light's wave properties upon entering the water is correct?

(a) The light's speed, frequency and wavelength all stay the same

(b) The light's speed, frequency and wavelength all change

(c) The light's speed speed and frequency change, but the wavelength stays the same

(d) The light's wavelength and speed changes, but the frequency stays the same

30. An object rolls along level ground to the right at constant speed. Must there be any forces pushing this object to the right?

(a) No. while there can be forces acting, no force MUST act.

(b) No: no forces can act to the right

(c) yes : the only forces that act must be to the right

(d) Yes : but there could also be a friction force acting to the left

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31. The capacity of a spherical condenser is 1 μ F. If the spacing between the two sphers is 1mm, the radius of the outer sphere is

(a) 3 cm

(b) 6 cm

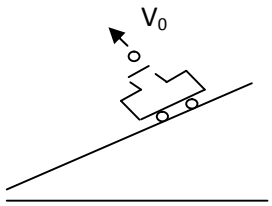
(c) 3 m

(d) 6 m

32. Mercury orbits the sun in about one-fifth of the earth year. If 1 au is defined as the distance from the earth to the sum, what is the approximate distance between mercury and the sun?

(a) (1/25) au (b) (1/9) au (c) (1/5) au (d) (1/3) au

33. A cart is sliding down a low friction incline. A device on the cart launches a ball, forcing the ball perpendicular to the incline, as shown above . Air resistance is negligible. Where will the ball land relative to the cart, and why?



(a) The ball will land in front of the cart, because the ball's acceleration component parallel to the plane is greater than the cart's acceleration component parallel to the plane

(b) The ball will land in front of the cart, because the ball has a greater magnitude of acceleration than the cart

(c) The ball will land in the cart, because both the ball and the cart have the component of acceleration parallel to the plane

(d) The ball will land in the cart, because both the ball and the cart have the same magnitude of acceleration

34. The power of the heater is 1000 W at 1000^0 C. What will be its power at 400^0C?

Given, temperature coefficient of resistance of heater-wire is $1.4 \times 10^{-4}\ ^0C^{-1}$.

(a) 4.2×10^3 W (b) 1.3×10^3 W

(c) 9.68×10^2 W (d) 1.08×10^3 W

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35. A spacecraft of mass M moving with velocity v in free space explodes and breaks into two pieces. After the explosion, a mass m of the spacecraft is left stationary. The velocity of the othe7r part is

(a) $\frac{mv}{M-m}$ (b) $\frac{M+m}{M}$

(c) $\frac{Mv}{M-m}$ (d) $\frac{Mv}{m}$

36. The potential energy as a function of the force between two atoms in a diatomic molecules is given by $U(x) = \frac{A}{x^{12}} - \frac{B}{x^{6}}$, where A and B are positive constants and x-refers to the distance between atoms. The position of stable equilibrium for the system of the two atoms is given as

(a) $x = \frac{A}{B}$ (b) $x = \sqrt{\frac{A}{B}}$

(b) $x = \sqrt{\frac{3A}{B}}$ (d) $x = \left(\frac{2A}{B}\right)^{\frac{1}{6}}$

37. The work of 146 kJ is performed in order to compress 1 kilo mole of a gas adiabatically and in the process the temperature of the gas increases by 7^0 C. The gas is ($R = 8.3\ J\ mol^{-1}\ K^{-1}$)

(a) diatomic

(b) a mixture of monoatomic and diatomic

(c) monoatomic

(d) triatomic

38. Two conductors have the same resistance at 0^0 C but their temperature coefficient of resistance are α_1 and $\sim_2$. The respective temperature coefficient of their series and parallel combinations are nearly

(a) $\frac{\sim_1+\alpha_2}{2}, \alpha_1 + \alpha_2$ (b) $\alpha_1+\alpha_1, \frac{\alpha_1+\alpha_2}{2}$

(c) $\frac{\sim_1+\alpha_2}{3}, \alpha_1 + \alpha_2$ (d) $\frac{\sim_1+\alpha_2}{2}, \frac{\alpha_1+\alpha_2}{2}$

39. A long horizontally fixed wire carries a current of 100 ampere. Directly above and parallel to it is a fine wire that carries a current of 20 ampere and weights 0.04 newton per meter. The distance between the two wires for which the upper wire is just supported by magnetic repulsion is

(a) 10^{-2} mm (b) 10^{-2} cm

(c) 10^{-2} m (d) 10^{-2} km

40. An emf of 15 V is applied in a circuit containing 5 H inductance, 10 Ω resistance. The ratio of currents at time $t = \infty$ and $t = 1$ is

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(a) $\frac{e}{e^2-1}$ (b) $\frac{e^2}{e-1}$

(c) $\frac{e}{1-e^2}$ (d) $\frac{e^2}{e^2-1}$

41. What is the ratio of wavelength of a photon and that of an electron (of mass, m) of the same energy (E)?

(a) $c\sqrt{\frac{2m}{E}}$ (b) $\sqrt{\frac{2m}{E}}$

(d) $c\sqrt{\frac{2m}{E}}$ (d) $\sqrt{\frac{m}{E}}$

42. An electric kettle has two heating elements. One brings it to boil in 10 min and the other in 15 min. If two heating elements are connected in parallel, the water in kettle will boil in

(a) 5 min (b) 6 min

(b) 7 min (d) 25 min

43. A double convex lens of glass of refraction index μ is immersed in a medium of refractive index μ_1. If a parallel beam emerges undeviated through the lens, then

(a) $\mu = \mu_1$ (b) $\mu = \frac{1}{\mu_1}$

(c) $\mu > \mu_1$ (d) $\mu < \mu_1$

44. Assume velocity of sound in air as 333.68 ms^{-1}. A hollow tube is placed vertically in a jar containing water. Air in the tube is vibrated by correction. Second resonance is obtained when the distance of the brass tube from the surface of water is

(a) 0.215 m (b) 0.43 m

(c) 0.645 m (d) 0.33 m

45. During one cycle of a heat engine 2000 calories of heat is supplied and 1500 calories rejected. The amount of work done equal (assuming J = 4.186 J/cal)

(a) 2093 J (b) 4186 J

(c) 1042 J (d) 0

46. A mass, m undergoes a free fall. What is the linear momentum of the mass after it has fallen through a height h?

(a) $m\sqrt{gh}$ (b) $m\sqrt{2gh}$

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(b) $m\sqrt{g/h}$ (d) $2m\sqrt{gh}$

47. The dimensions of strain is

(a) L (b) L^2

(c) it is dimensionless (d) ML^2T^{-2}

48. A beam of protons is moving horizontally towards you. As it approaches you, it passes through a magnetic field which is directed upwards. As you see it, the magnetic field will deflect the beam to the

(a) right (b) left

(c) top (d) bottom

49. Fiber optic transmission is based on the phenomenon of

(a) interference

(b) polarization

(c) total internal reflection

(d) photoelectric effect

50. When light travels from a rarer to a denser medium, the speed of light in the medium

(a) increases

(b) decreases

(c) remains the same

(d) first increases and then decreases

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